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EXAMINER	
ALEJANDRO, RAYMOND	
ART UNIT	**PAPER NUMBER**
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/738,400	HYUNG ET AL.	
	Examiner	Art Unit	
	Raymond Alejandro	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for domestic priority under 35 U.S.C. 119(e).

Drawings

2. The drawings were received on 04/12/04. These drawings are acceptable.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 5 is indefinite because molar amounts "x", "y" and "z" are not defined. Thus, it is not possible to clearly ascertain the specific composition of the compound $LiNi_{1-x}Co_yMe_zO_2$.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Hall 5993993 as evidenced by Smith et al 6245461.

The present invention is directed toward a lithium electrochemical cell system wherein the disclosed inventive concept comprises the specific electrochemical cells and the degassing agent.

In relation to claim 1:

Hall discloses a battery system including a plurality of electrically connected cells, each of the cells having a positive electrode, a graphitic negative electrode (*the crystalline carbon negative electrode*) (ABSTRACT/ COL 7, line 65 to COL 8, line 10/CLAIM 1-2). The invention of Hall comprises a very large number of small battery cells which are assembled into a cell module (ABSTRACT), at least more than two Li-ion cells are bussed to create a module, specifically 36 Li-ion cells (COL 5, lines 47-55/ FIGURE 1-2 and 4).

The cathode of the Li-ion cells comprises a lithium metal oxide such as $Li_xMn_2O_4$, Li_xNiO_2, Li_xCoO_2 and the like (COL 7, line 65 to COL 8, line 10/ CLAIM 1-2). The negative electrode is of a material such as graphite (COL 8, lines 3-7/ CLAIM 1-2). *Electrochemical cells necessarily require an electrolyte system for carrying out the electrochemical reaction for power generation. Thus, the electrolyte is inherently included in the electrochemical cell.*

Examiner's Note: *claim 1, as originally presented, calls for a secondary Li-ion cell, a Li-ion secondary electrochemical cell; and a Li-metal based primary or secondary electrochemical cell. In this case, the examiner has interpreted the claim language as requiring either a "Li-metal based primary electrochemical cell" or any "secondary electrochemical cell. Hence, since Hall discloses more than two electrochemical cells connected in the module, the teachings of Hall satisfy the claimed requirement. Moreover, since the claim recites that "Li-ion secondary electrochemical cell has an electrolyte having a first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

Yet further, since Hall does not expressly disclose an electrolyte, Smith et al is being cited herein to evidence first that Li-ion cells necessarily includes an electrolyte as set forth above, as well as to show that Li-ion cells also necessarily employ a blend of organic solvents. Refer to Smith et al where it is disclosed that the conventional Li-ion battery uses a Li-salt dissolved in one or more organic solvents (Smith et al at COL 2, lines 1-10).

As to claim 2:

Smith et al further evidence Hall in that the electrolyte consists of an organic solvent which includes propylene carbonate, dimethyl carbonate, ethylene carbonate and the like (Smith et al at COL 5, lines 49-55).

As to claim 3:

Smith et al further evidence Hall in that $LiPF_6$ or $LiClO_4$ or $LiBF4_4$ is typically used in conventional Li-ion battery (Smith et al at COL 2, lines 1-10 and Col 5, lines 49-55).

Thus, the present claims are anticipated.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Frech et al 2002/0160271.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific solid polymer electrolyte and the negative electrode including Li-metal.

Frech et al disclose that, generally speaking, current state-of-the-art lithium cells or batteries consists of a cathode, an anode, and an electrolyte, wherein the cell employ lithium

metal as the anode, and a lithium metal oxide such as $Li_xMn_2O_4$, Li_xNiO_2, Li_xCoO_2 as the cathode; and a liquid or solid electrolyte (P0005), the composition of the electrolyte being liquid electrolytes or solid polymeric electrolytes (P0006).

Examiner's Note: *since claim 5 recites that Li-metal based primary and the secondary electrochemical cell has an electrolyte having "a second first degassing agent", it is contended that the very same composition of the electrolyte (either the solvents and/or the salt) is capable of being the degassing agent. Note that the claimed degassing agent is neither a different composition nor an additional compound.*

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because Frech et al teach that solid polymeric electrolyte are particularly attractive since they offer new opportunities in design that ate not available with other electrolytic systems, for example, solid polymeric electrolytes would be ale to expand/contract within the cell to ensure continuous and full interfacial contact with the electrodes as volume changes within the cell occur in operation; additionally, solid polymeric materials would enable cells to be more easily fabricated; and eliminate concerns over leakage and drying problems; may be formed into thin films to minimize resistance and to reduce overall volume and weight of the cell.

As far as the negative electrode including Li-metal, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific solid polymer electrolyte of Frech et al in the Li-battery cells of Hall-Smith et al because

Frech et al make public that Li-metal is highly preferred because it is a high specific energy material. Thus, it offers high energy density.

12. Claims 6-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Besenhard et al 6942949.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Besenhard et al disclose a rechargeable lithium electrochemical cell comprising an electrolyte including a Li-salt, solvents and an additive such as 1,5 hexadiene (ABSTRACT/Col 2, lines 63-67/ COL 3, line 65-67).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Besenhard et al in the Li-battery cells of Hall-Smith et al because Besenhard et al disclose that the specific compound (the degassing agent) assists in the formation of a passivation layer on the cathodes, and sensitiveness of the battery against overcharge is reduced; and such an additive, when added in the electrolyte, does not deteriorates the properties of the battery anodes.

13. Claims 6-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Abraham et al 4489145.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Abraham et al disclose lithium cells comprising an additive in the non-aqueous electrolyte for improving the cycle life of the cell (ABSTRACT); said additive may be 2,4-dimethyl-1,3-pentadiene (COL 6, lines 51-65).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Abraham et al in the Li-battery cells of Hall-Smith et al because Abraham et al makes known that the use of said additive (the specific degassing agent) in the non-aqueous electrolyte improves the cycle life of the cell.

14. Claims 6-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Lucas et al 3567601.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of

Lucas et al in the Li-battery cells of Hall-Smith et al because Lucas et al disclose al that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Chen et al 20030157413.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Chen et al disclose Li-ion batteries with improved safety (TITLE) that utilizes one or more additives in the battery electrolyte solution wherein a Li-salt is dissolved in an organic solvent containing propylene carbonate, and a blend of triphenyl phosphate and vinyl ethylene carbonate. This blend which is an additive has been found to significantly enhance the safety and performance of Li-ion batteries (ABSTRACT/Claims 1 and 11).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of

Chen et al in the Li-battery cells of Hall-Smith et al because Chen et al teach that their blend additive has been found to significantly enhance the safety and performance of Li-ion batteries.

16. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Denton, III 5962168.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Denton, III disclose electrochemical cells (TITLE/ABSTRACT) wherein, one alternative embodiment, the electrolyte solvent may be either a polymer blend or a co-polymer of low-PVDF and one or more other low molecular weight polymers among poly(vinyl pyridine), and combinations thereof (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Denton, III in the Li-battery cells of Hall-Smith et al because Denton, III teach that their blend additive has many advantages as an electrolyte solvent of an electrochemical cell. It's thermodynamic stability (e.g., electrochemical stability) is independent of number average molecular weight; it is more miscible with other liquids than is high number average molecular weight PVDF; it can accommodate high concentrations of Li salt while allowing high Li ion diffusion rates, an important criteria for use in Li batteries. It will have good solvent-like miscibility and compatibility with high number average molecular weight PVDF (high-PVDF,

i.e.). This is important since many lithium batteries now use high-PVDF, which is substantially a solid, as a binder in the electrodes of such cells. Finally, it melts well below room temperature, is not viscous, and is not volatile. It is a flame retardant which renders it a good choice for an electrolyte solvent, whether used alone or in combination with other solvents.

17. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Kubota et al 5654114.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Kubota et al disclose that for the purpose of improving a variety of characteristics for the battery such as cyclic characteristics, an over-discharge suitability, and an over-charge suitability, the following ingredients may be optionally added to at least one kind of electrolytic solutions or electrodes in a battery, among others: piperazine, pyridine, pyridine derivatives, etc. (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Kubota et al in the Li-battery cells of Hall-Smith et al because Kubota et al disclose that piperazina may be added to a least the electrolytic solutions for the purpose of improving a variety of characteristics for the battery such as cyclic characteristics, an over-discharge suitability, and an over-charge suitability.

18. Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Sato et al 2004/0001302.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Sato et al disclose the use of styrene carbonate in electrolytes (P0060) of batteries (P0002-0003).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Sato et al in the Li-battery cells of Hall-Smith et al because Sato et al disclose the suitability of using styrene carbonate (the specific degassing agent) in electrolytes. Thus, Sato et al recognize the benefit of using styrene carbonate as a stable and compatible additive for electrolyte solvents.

19. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of the Japanese publication JP 10-040928 (heretofore the JP'928).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

The JP'928 discloses a non-aqueous electrolyte battery e.g. lithium cell – having non-aqueous electrolyte solution in which predefined amount of a piperidine group compound is added (ABSTRACT).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of the JP'928 in the Li-battery cells of Hall-Smith et al because the JP'928 disclose that piperidine, when added in the electrolyte, improves discharge capacity, suppresses self discharge characteristic, and offers a high industrial value.

20. Claims 11 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Lucas et al 3567601 in combination with Chen et al 20030157413.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Lucas et al in the Li-battery cells of Hall-Smith et al because Lucas et al disclose al that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific

compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

Additionally, none of the preceding references expressly discloses the specific vinyl ethylene carbonate and/or triphenyl phosphate.

Chen et al disclose Li-ion batteries with improved safety (TITLE) that utilizes one or more additives in the battery electrolyte solution wherein a Li-salt is dissolved in an organic solvent containing propylene carbonate, and a blend of triphenyl phosphate and vinyl ethylene carbonate. This blend which is an additive has been found to significantly enhance the safety and performance of Li-ion batteries (ABSTRACT/Claims 1 and 11).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Chen et al in the Li-battery cells of Hall-Smith et al and Lucas et al because Chen et al teach that their blend additive has been found to significantly enhance the safety and performance of Li-ion batteries.

21. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Abraham et al 4489145 in combination with Denton, III 5962168.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Abraham et al disclose lithium cells comprising an additive in the non-aqueous electrolyte for improving the cycle life of the cell (ABSTRACT); said additive may be 2,4-dimethyl-1,3-pentadiene (COL 6, lines 51-65).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Abraham et al in the Li-battery cells of Hall-Smith et al because Abraham et al makes known that the use of said additive (the specific degassing agent) in the non-aqueous electrolyte improves the cycle life of the cell.

Additionally, none of the preceding references expressly discloses the specific vinyl pyridine.

Denton, III discloses electrochemical cells (TITLE/ABSTRACT) wherein, one alternative embodiment, the electrolyte solvent may be either a polymer blend or a co-polymer of low-PVDF and one or more other low molecular weight polymers among poly(vinyl pyridine), and combinations thereof (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Denton, III in the Li-battery cells of Hall-Smith et al because Denton, III teach that their blend additive has many advantages as an electrolyte solvent of an electrochemical cell. It's thermodynamic stability (e.g., electrochemical stability) is independent of number average

molecular weight; it is more miscible with other liquids than is high number average molecular weight PVDF; it can accommodate high concentrations of Li salt while allowing high Li ion diffusion rates, an important criteria for use in Li batteries. It will have good solvent-like miscibility and compatibility with high number average molecular weight PVDF (high-PVDF, i.e.). This is important since many lithium batteries now use high-PVDF, which is substantially a solid, as a binder in the electrodes of such cells. Finally, it melts well below room temperature, is not viscous, and is not volatile. It is a flame retardant which renders it a good choice for an electrolyte solvent, whether used alone or in combination with other solvents.

22. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Besenhard et al 6942949 in combination with Kubota et al 5654114.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Besenhard et al disclose a rechargeable lithium electrochemical cell comprising an electrolyte including a Li-salt, solvents and an additive such as 1,5 hexadiene (ABSTRACT/Col 2, lines 63-67/ COL 3, line 65-67).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Besenhard et al in the Li-battery cells of Hall-Smith et al because Besenhard et al disclose that the specific compound (the degassing agent) assists in the formation of a passivation layer on the

cathodes, and sensitiveness of the battery against overcharge is reduced; and such an additive, when added in the electrolyte, does not deteriorates the properties of the battery anodes.

Additionally, none of the preceding references expressly discloses the specific piperazine.

Kubota et al disclose that for the purpose of improving a variety of characteristics for the battery such as cyclic characteristics, an over-discharge suitability, and an over-charge suitability, the following ingredients may be optionally added to at least one kind of electrolytic solutions or electrodes in a battery, among others: piperazine, pyridine, pyridine derivatives, etc. (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Kubota et al in the Li-battery cells of Hall-Smith et al because Kubota et al disclose that piperazina may be added to a least the electrolytic solutions for the purpose of improving a variety of characteristics for the battery such as cyclic characteristics, an over-discharge suitability, and an over-charge suitability.

23. Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Lucas et al 3567601 in combination with the Japanese publication JP 10-270082 (heretofore the JP'082).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Lucas et al in the Li-battery cells of Hall-Smith et al because Lucas et al disclose al that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

Additionally, none of the preceding references expressly discloses the specific styrene.

The JP'082 discloses Li-cells or Li-ion batteries including an electrolyte salt containing styrene butadiene rubber and acrylonitrile butadiene rubber subjected to synthesis after mixture formation (ABSTRACT).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of the JP'082 in the Li-battery cells of Hall-Smith et al because the JP'082 discloses that it provides advantages such as aiding in raising capacitance and performance of battery; eases film forming process; suits mass production at stable quality; and facilitates thinning of electrolyte film in simple manner.

24. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Lucas et al 3567601 in combination with the Japanese publication 10-040928 (heretofore the JP'928).

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Lucas et al in the Li-battery cells of Hall-Smith et al because Lucas et al disclose al that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

Additionally, none of the preceding references expressly discloses the piperidine.

The JP'928 discloses a non-aqueous electrolyte battery e.g. lithium cell – having non-aqueous electrolyte solution in which predefined amount of a piperidine group compound is added (ABSTRACT).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of the JP'928 in the Li-battery cells of Hall-Smith et al because the JP'928 disclose that piperidine, when added in the electrolyte, improves discharge capacity, suppresses self discharge characteristic, and offers a high industrial value.

25. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Besenhard et al 6942949 in combination with Denton, III 5962168.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Besenhard et al disclose a rechargeable lithium electrochemical cell comprising an electrolyte including a Li-salt, solvents and an additive such as 1,5 hexadiene (ABSTRACT/Col 2, lines 63-67/ COL 3, line 65-67).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Besenhard et al in the Li-battery cells of Hall-Smith et al because Besenhard et al disclose that the specific compound (the degassing agent) assists in the formation of a passivation layer on the cathodes, and sensitiveness of the battery against overcharge is reduced; and such an additive, when added in the electrolyte, does not deteriorates the properties of the battery anodes.

Additionally, none of the preceding references expressly discloses the specific vinyl pyridine.

Denton, III discloses electrochemical cells (TITLE/ABSTRACT) wherein, one alternative embodiment, the electrolyte solvent may be either a polymer blend or a co-polymer of low-PVDF and one or more other low molecular weight polymers among poly(vinyl pyridine), and combinations thereof (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Denton, III in the Li-battery cells of Hall-Smith et al because Denton, III teach that their blend additive has many advantages as an electrolyte solvent of an electrochemical cell. It's thermodynamic stability (e.g., electrochemical stability) is independent of number average molecular weight; it is more miscible with other liquids than is high number average molecular weight PVDF; it can accommodate high concentrations of Li salt while allowing high Li ion diffusion rates, an important criteria for use in Li batteries. It will have good solvent-like miscibility and compatibility with high number average molecular weight PVDF (high-PVDF, i.e.). This is important since many lithium batteries now use high-PVDF, which is substantially a solid, as a binder in the electrodes of such cells. Finally, it melts well below room temperature, is not viscous, and is not volatile. It is a flame retardant which renders it a good choice for an electrolyte solvent, whether used alone or in combination with other solvents.

26. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Lucas et al 3567601 in combination with Denton, III 5962168.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Lucas et al disclose electrolytic processes in electrolytic cells (ABSTRACT) comprising electrolytes (COL 2, lines 43-48) comprising 2,3-dimethyl-1,3-butadiene (COL 2, lines 65-66).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Lucas et al in the Li-battery cells of Hall-Smith et al because Lucas et al disclose al that the specific compound (the degassing agent) assists in electrolytic process that occurs in the electrolytic cell. Thus, Lucas et al contemplate the desirability of including said specific compound in the electrolytic cell regardless of the particular chemical environment or functionality of the electrolytic cell. Lucas et al is pertinent to other references as well as the field of applicant's endeavor because Lucas et al envision the use of said specific compound in electrolytic cells, and batteries or electrochemical cell are also electrolytic-based systems.

Additionally, none of the preceding references expressly discloses the specific vinyl pyridine.

Denton, III discloses electrochemical cells (TITLE/ABSTRACT) wherein, one alternative embodiment, the electrolyte solvent may be either a polymer blend or a co-polymer of

low-PVDF and one or more other low molecular weight polymers among poly(vinyl pyridine), and combinations thereof (COL 4, lines 22-30).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Denton, III in the Li-battery cells of Hall-Smith et al because Denton, III teach that their blend additive has many advantages as an electrolyte solvent of an electrochemical cell. It's thermodynamic stability (e.g., electrochemical stability) is independent of number average molecular weight; it is more miscible with other liquids than is high number average molecular weight PVDF; it can accommodate high concentrations of Li salt while allowing high Li ion diffusion rates, an important criteria for use in Li batteries. It will have good solvent-like miscibility and compatibility with high number average molecular weight PVDF (high-PVDF, i.e.). This is important since many lithium batteries now use high-PVDF, which is substantially a solid, as a binder in the electrodes of such cells. Finally, it melts well below room temperature, is not viscous, and is not volatile. It is a flame retardant which renders it a good choice for an electrolyte solvent, whether used alone or in combination with other solvents.

27. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hall 5993993 as evidenced by Smith et al 6245461 as applied to claim 1 above, and further in view of Sato et al 2004/0001302 in combination with Yano et al 6507378.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Hall as evidenced by Smith et al are applied, argued and incorporated herein for the reasons discussed above. However, the preceding references do not expressly disclose the specific degassing agent.

Sato et al disclose the use of styrene carbonate in electrolytes (P0060) of batteries (P0002-0003).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Sato et al in the Li-battery cells of Hall-Smith et al because Sato et al disclose the suitability of using styrene carbonate (the specific degassing agent) in electrolytes. Thus, Sato et al recognize the benefit of using styrene carbonate as a stable and compatible additive for electrolyte solvents.

Additionally, none of the preceding references expressly discloses the specific vinyl piperazine.

Yano et al discloses examples of the quality improving monomers including, among others, vinyl monomers such as vinyl pyridine, vinyl piperidon, vinyl piperazine (COL 14, lines 49-53).

In view of the above, it would have been obvious to a person possessing a level of ordinary skill in the art at the time the invention was made to use the specific degassing agent of Yano et al in the Li-battery cells of Hall-Smith et al because Yano et al makes known that the specific vinyl piperazine is a quality improving monomer material suitable for improving adhesion, cohesion and/or heat resistance. *In this case, the teachings of Yano et al are fully applicable to the preceding references as well as to the field of applicant's endeavor because Yano et al address the same problem of improving quality by using polymeric materials and/or*

compositions. Specifically, Yano et al attributes special characteristics to the vinyl piperazine, all of which may be extended or applied to electrolyte systems adding polymeric material(s) as claimed by the applicant.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Raymond Alejandro
Primary Examiner
Art Unit 1745